No. 677,552. Patented July 2, 1901.

E. P. ALLEN.

VALVE FOR RADIATORS.

(Application filed May 21, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig 1

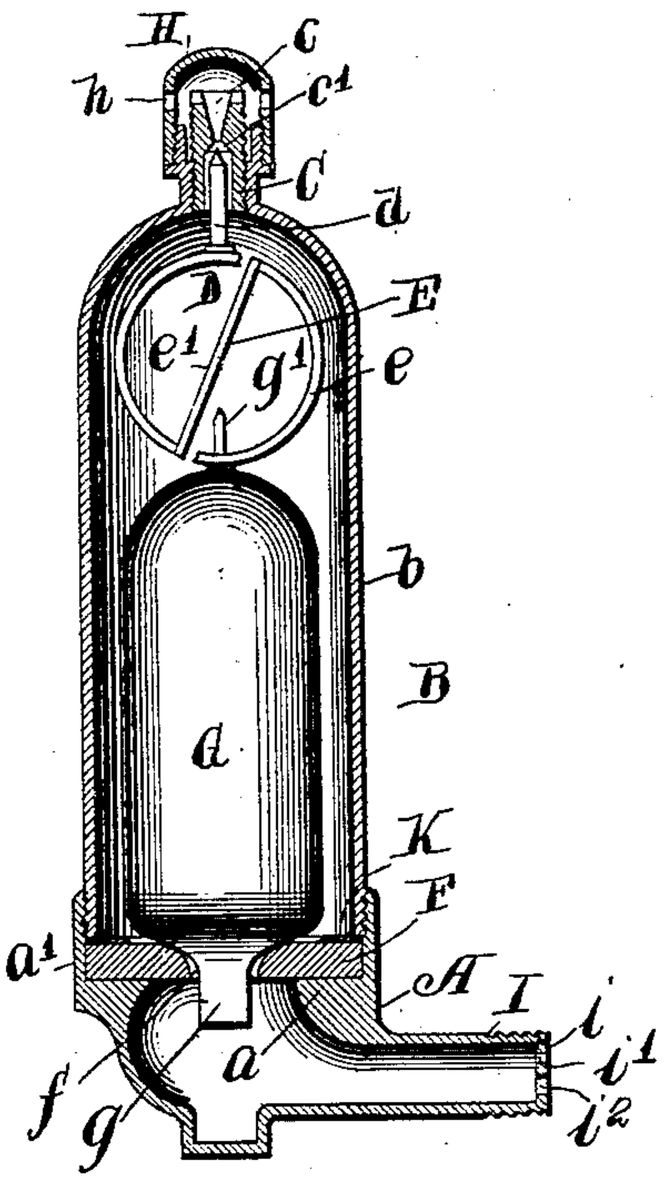


Fig 2

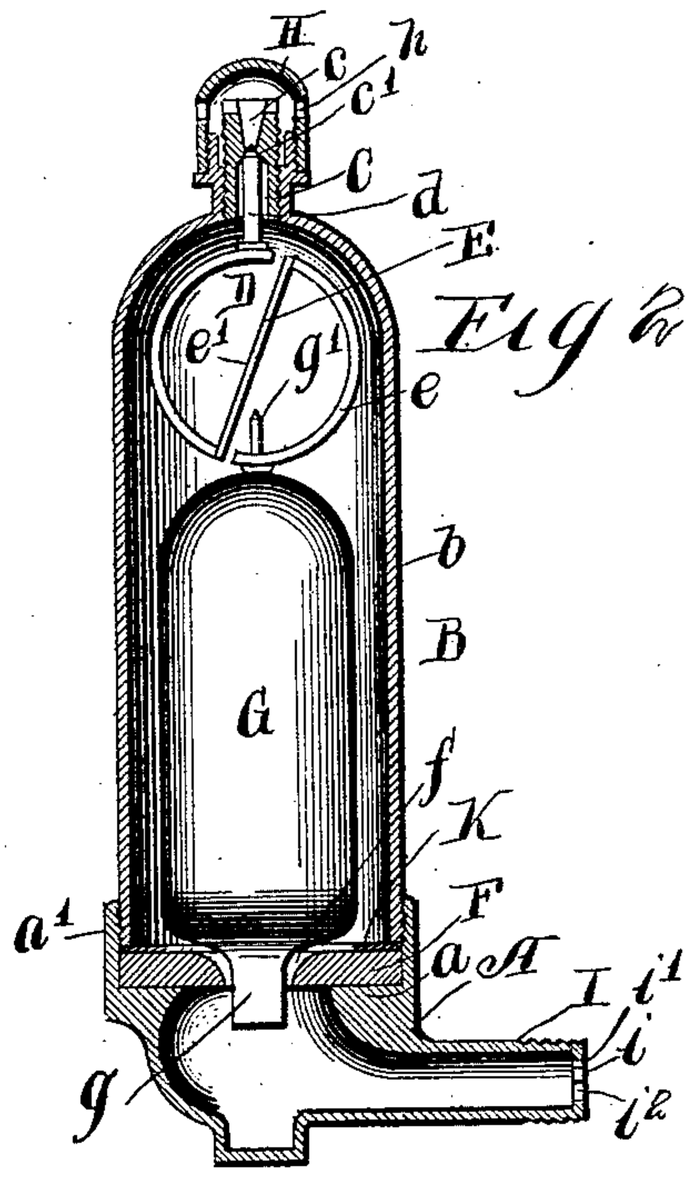


Fig 3

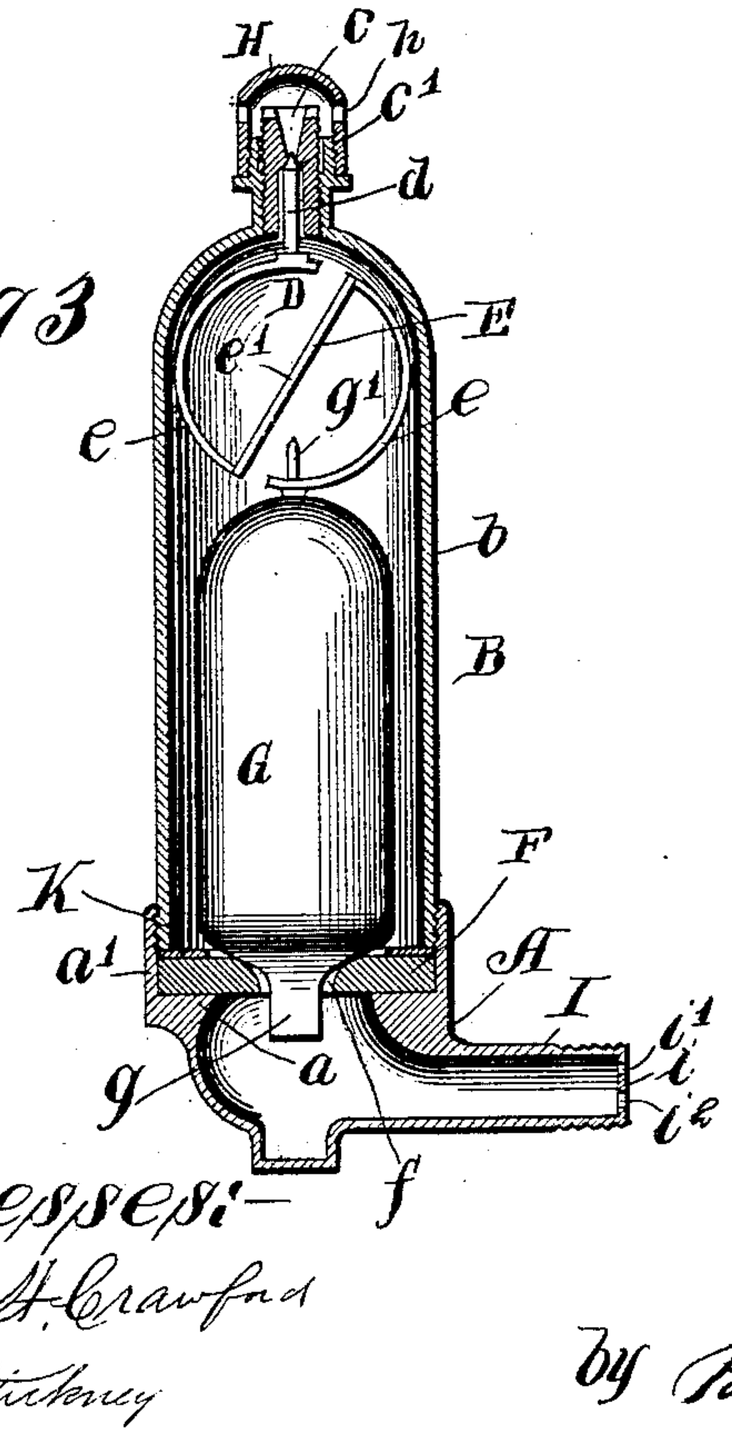
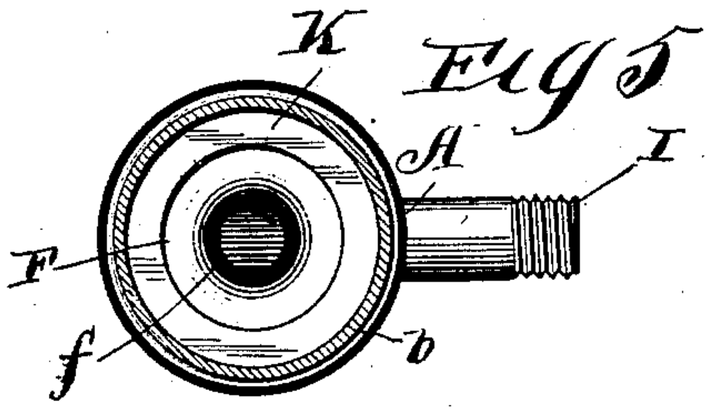


Fig 4

Fig 5



Witnesses:—
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His Attorneys

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(No Model.) 3 Sheets—Sheet 2.

Fig 6

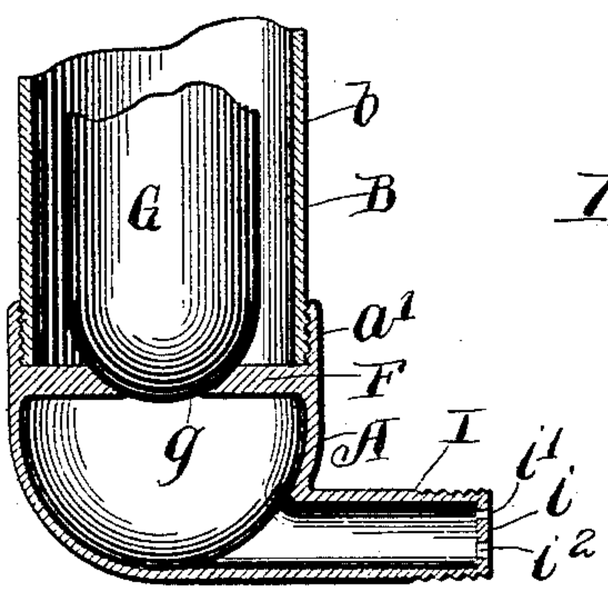


Fig 7

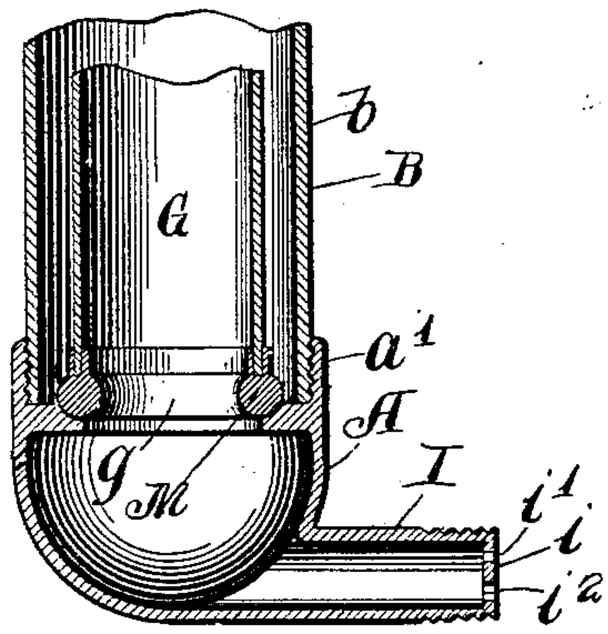


Fig 8

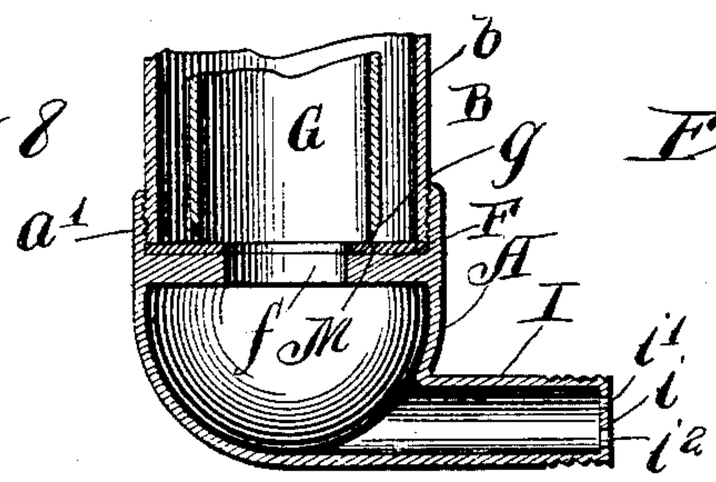


Fig 9

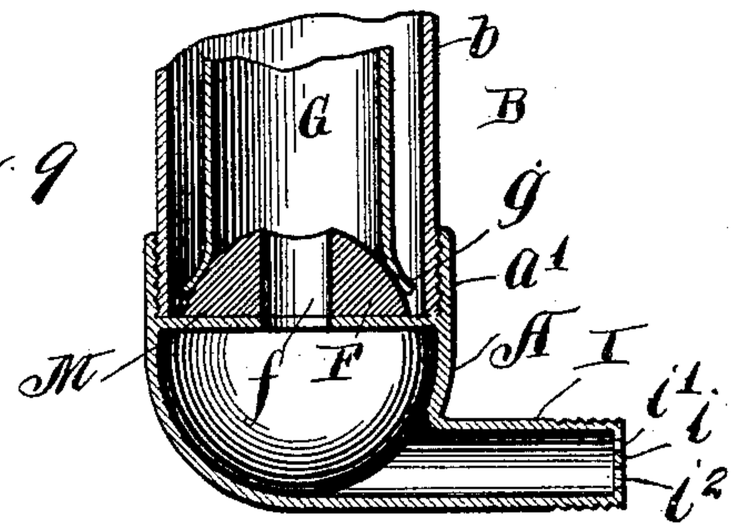


Fig 10

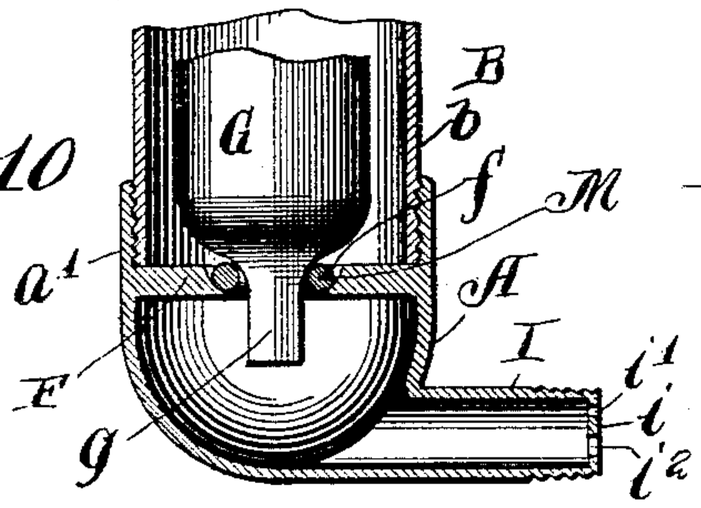
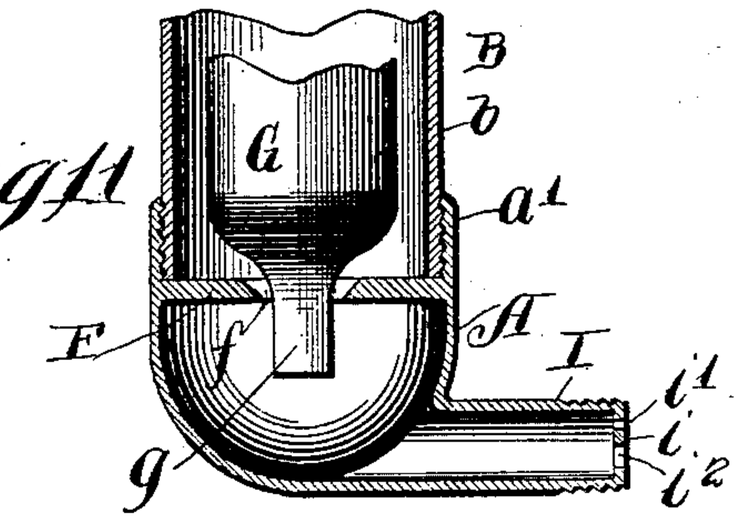


Fig 11



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VALVE FOR RADIATORS.

(Application filed May 21, 1900.)

(No Model.) 3 Sheets—Sheet 3.

Fig 12

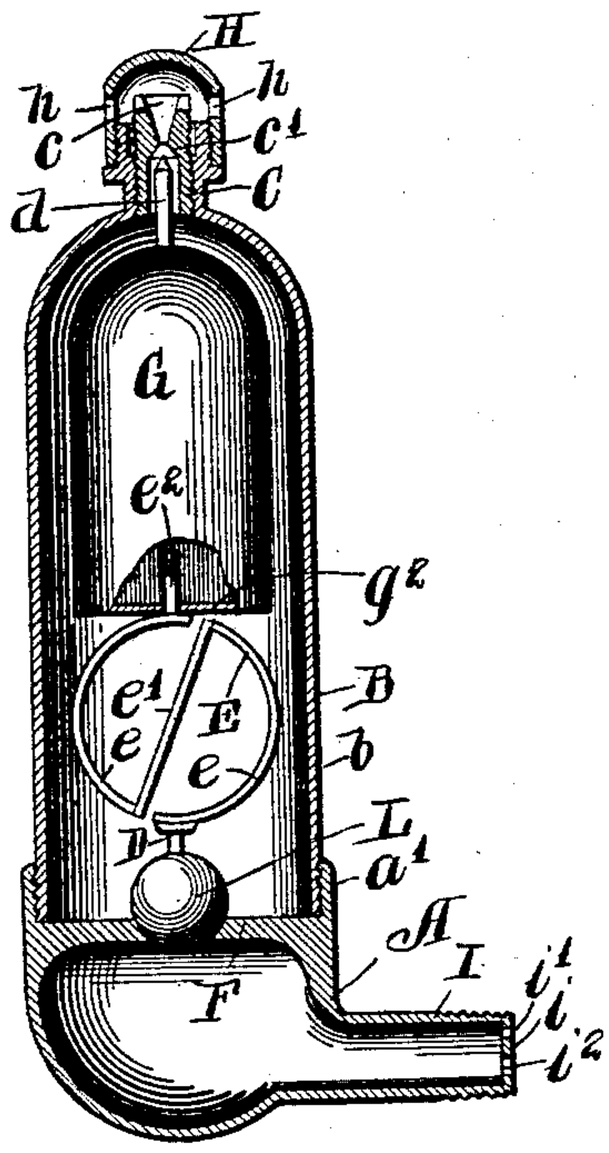
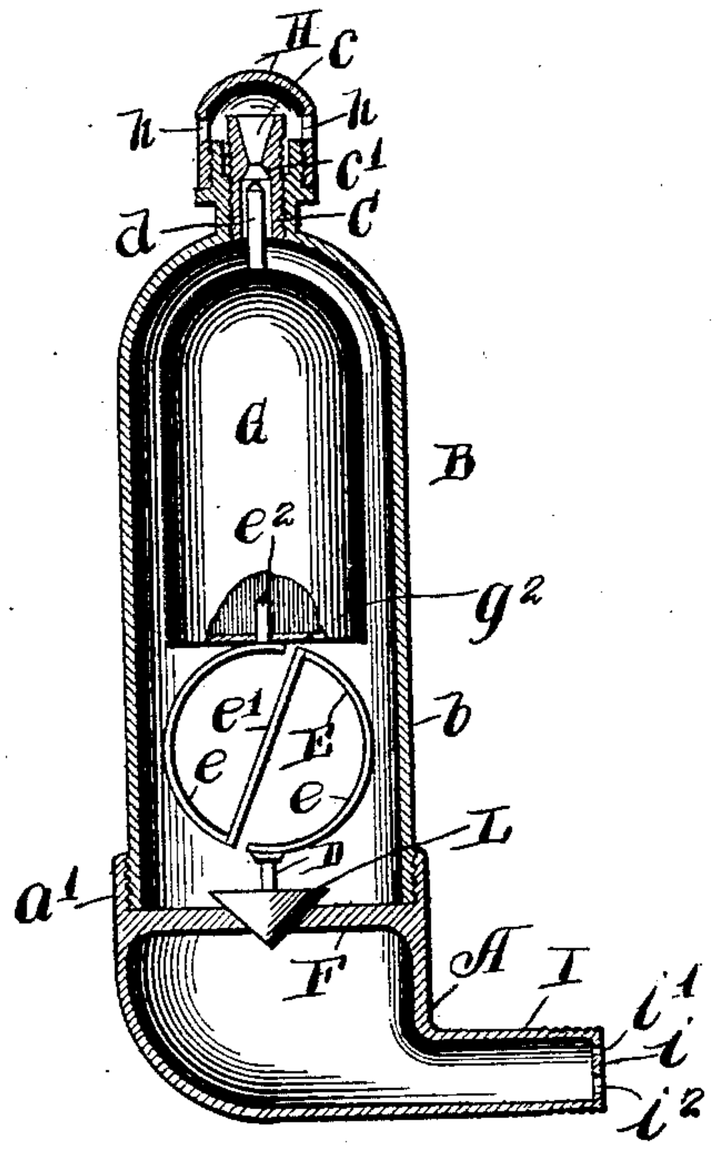


Fig 13



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UNITED STATES PATENT OFFICE.

EVERETT P. ALLEN, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO WILLIAM C. HILL, OF SAME PLACE.

VALVE FOR RADIATORS.

SPECIFICATION forming part of Letters Patent No. 677,552, dated July 2, 1901.

Application filed May 21, 1900. Serial No. 17,318. (No model.)

To all whom it may concern:

Be it known that I, EVERETT P. ALLEN, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Air-Valves for Radiators; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to air-valves of that class comprising a hollow casing, a float, a steam-valve, a valve to automatically prevent the ingress of air to the radiator, and a thermostatic member which operates the steam-valve.

The invention consists in the matters hereinafter set forth, and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a vertical longitudinal section through an air-valve embodying my invention, showing the vacuum-valve closed. Fig. 2 is a similar section showing the valve closed by the action of water. Fig. 3 is a similar section showing the valve closed by the expansion of the thermostatic member. Fig. 4 is a detail showing a side elevation of the thermostatic member. Fig. 5 is a transverse section showing in detail the valve-seat of the air-valve. Figs. 6, 7, 8, 9, 10, and 11 are details showing different forms of construction of the vacuum-valve. Figs. 12 and 13 are vertical sections showing a different order of arrangement of the thermostatic member and float.

Referring to the drawings, A is a hollow base, and B an upper chamber forming, with the base, a closed casing. The upper chamber may be of any desired form. As shown, it is dome-shaped and referred to hereinafter as the "dome." A plug C is inserted in the upper part of said dome, having an orifice *c*, constituting an air-outlet. Said orifice is provided with a valve-seat *c'*.

D is a valve-closure consisting of a pin *d*, whose upper end is fitted to close on the valve-seat *c'*. The lower end of said pin *d* is operatively connected to a thermostatic member E.

A diaphragm F, centrally apertured, is secured between the hollow base and the dome. A float G constitutes, with said diaphragm F, a valve to prevent the ingress of air to the radiator. Said float G and thermostatic member E are means for operating the valve-closure D. A protecting-cap H, having orifices *h*, is removably secured over the plug C. A connecting-nipple I is provided on the base, by which the whole structure may be secured to the radiator and steam admitted thereby.

The operation of the device, so far as described, is like that of similar valves heretofore used and will be readily understood. When steam enters the casing, the expansion of the thermostatic member E forces the valve-closure D to its seat *c'*, thereby closing the air-outlet *c*. When water enters, it raises the float G, which likewise operates the valve-closure D, and seals the air-outlet *c*. If the radiator becomes free from steam, the float G drops on the diaphragm F, closes the aperture of said diaphragm, and thereby prevents the entrance of air into the radiator.

Reference will now be made to the special features of construction constituting the improvements herein claimed and the advantages derived therefrom.

The diaphragm F, as shown in Fig. 1, may be made of a mixture of plumbago and asbestos held by a binding material or of any similar substance, or may be metallic. Said diaphragm F is faced to closely fit on an inner flange *a*, formed on the wall *a'* of the base A, and is clamped thereon by a washer K, which is secured by the lower end of the dome B, said lower end having screw-threaded connections with the upper portion of the said base A. Said diaphragm F is provided with a central aperture *f*. A short cylindrical hollow stem *g* is formed on the lower end of the float G by contracting and drawing in the side walls of said float. Said stem, which is inserted in said diaphragm-orifice *f*, has less diameter than said orifice to allow free passage of steam. It is adapted to hold said float G centrally within said dome B and free from contact with the side walls *b* of said dome. A small pin *g'* is vertically secured to the upper end of said float G. The thermostatic member E is circular in form and comprises two narrow metallic strips *e*, each

bent in the form of a half-circle and joined at their alternate opposite ends by a straight strip e', which corresponds in relative position to said curved strips e to the diameter of the circle. The free end of one strip is swiveled on the pin g' of the float G, said pin having free vertical movement relative to said strip. The free end of the other strip is rigidly secured to the lower end of the valve-pin d, the upper end of which is guided by the walls of the orifice c to its valve-seat c'. The connecting-nipple I has a transverse diaphragm i in its outer or connecting end. Said diaphragm is provided with two orifices i' i^2, vertically disposed over each other, which comprise, respectively, the steam-inlet and water-outlet to said air-valve as a whole.

The action of the valve in detail is as follows: When water of condensation enters the base A and rises in the dome B, it lifts the float G, which carries with it the thermostatic member E, and thereby forces the valve-closure D against its valve-seat c', sealing the opening c. When live steam forces its way into the base, it enters by the upper orifice i', as it has a less head of water at that point to contend against. It thereby displaces the water in the casing, driving it out through the lower orifice i^2. Said steam heats the thermostatic member E, which expands and uncoils, and in so doing forces the float G and the valve-closure D apart, as the float falls with the receding water, seating the float upon the diaphragm F and holding the closure D against its seat c', thereby effectually preventing the egress of steam. When the radiator cools and a vacuum is formed therein, the thermostatic member contracts, drawing the closure D away from its seat, but leaving the float G in close contact with the valve-diaphragm F. The steam left in said dome condenses and the water formed covers the juncture of said diaphragm and float, thereby sealing the interior of the radiator against the entrance of air. The more complete the vacuum the more effectually does the float seal the aperture of the diaphragm, as the inward atmospheric pressure holds said float more firmly against said seat. A partial vacuum is thus maintained for some time in the radiator, and the hot vapor from the boiler, which would not enter the radiator against atmospheric pressure unless forced there by a high degree of heat and consequent boiler-pressure, circulates through the radiator and an economy of heat and fuel results.

It is obvious that the arrangement of parts shown may be varied without impairing the efficiency of the valve. Such a variation is shown in Figs. 12 and 13. In this instance the valve-closure D is directly connected to the top of the float G. The thermostatic member E has a swivel-pin e^2 connected to the free end of one of its strips, by which it is pivoted to a lower cross-wall g^2, which closes the lower end of the float G. The free end of the other strip of the thermostatic member is suitably connected to a valve-closure L, adapted to seat itself upon the diaphragm F and seal the aperture therein. The operation of this modification of form is essentially the same as the device first illustrated. When water rises in the dome B, it causes the float G to rise and seal the orifice c with the valve-closure D. When steam enters the dome, it expands and uncoils the thermostatic member E, forcing the dome and closure D up against the valve-seat c' and the valve-closure member L against its seat on the diaphragm. When the radiator becomes cold, the steam in the dome condenses, and the water there formed seals the juncture between the valve-diaphragm and the valve-closure L and prevents the passage of air into the radiator.

It is evident that different forms of float and valve-closures may be used. As shown in Fig. 6, the float G has a sealed hemispherical bottom g, seating itself upon a diaphragm F, integral with the base and properly apertured. Fig. 7 shows a packing-ring M secured to the annular end of the float G. A flat soft packing-ring M, Fig. 8, may be employed, with the edges of the float G beveled to make a close contact. In Fig. 9 the packing M has the form of a hemisphere, secured on the diaphragm F by its plane surface, and the end g of the diaphragm flared to set around it. In Fig. 10 a round ring M, of rubber or other suitable material, is laid in the aperture f, and the contracted end g of the float adapted to seat itself thereon. In Fig. 11 a diaphragm F, integral with the base, is shown, and the contracted end g closes on a beveled edge of the aperture f.

I do not limit myself to any special design of form of said parts.

I claim as my invention—

1. An air-valve for a radiator comprising a hollow casing provided with a steam-inlet and an air-outlet, a valve adapted to close said air-outlet, a thermostatic member, a float carrying a valve to prevent ingress of air into said radiator, said thermostatic member and float being interposed between said valves.

2. An air-valve for a radiator comprising a hollow base provided with a steam-inlet and a water-outlet, an upper dome provided with an air-outlet, an apertured diaphragm between said base and said dome, a valve-closure to close said air-outlet, a float to operate said valve, a valve-closure carried by said float to close said diaphragm-aperture, and a thermostatic member interposed between the valve-closure of the air-outlet and the valve-closure of the diaphragm.

3. An air-valve for radiators comprising a hollow base having a steam-inlet, an upper dome provided with an air-outlet, an apertured diaphragm secured between said base and said dome, a valve-closure to close said air-outlet, a thermostatic member, a float, carrying a valve-closure to close said diaphragm-

aperture against the passage of air from said air-outlet to said steam-inlet, said thermostatic member and float being interposed between said valve-closures.

4. In an air-valve for radiators, the combination with a casing having a duct adapted to form a communication with a radiator and an air-vent, valves for controlling said duct and vent, one of said valves being carried by a float, and a thermostat operatively interposed between the float and the other valve.

5. An air-valve for a radiator comprising a hollow base provided with a steam-inlet and an air-outlet, an upper dome provided with an air-outlet, an apertured diaphragm between said base and said dome, a valve-closure to close said air-outlet, a valve-closure to close said diaphragm-aperture, a float connected to said diaphragm-closure, and a metallic thermostatic member interposed between said air-outlet closure and said float.

6. In an air-valve for radiators the combination with a casing having a duct to communicate with a radiator and an air-vent, of a float and thermostat carried thereby designed to close said vent; said float being constructed to close communication between the casing and a radiator.

In testimony that I claim the foregoing as my invention I hereby affix my signature, in presence of two witnesses, this 19th day of May, A. D. 1900.

EVERETT P. ALLEN.

Witnesses:

C. R. STICKNEY,

C. CLARENCE POOLE.